



Department of Energy
Carlsbad Field Office
P. O. Box 3090
Carlsbad, New Mexico 88221

ENTERED

JUN 02 2004



Mr. Steve Zappe, WIPP Project Leader
Hazardous Waste Permits Program
New Mexico Environment Department
2905 E. Rodeo Park Drive, Bldg. 1
Santa Fe, NM 87505

Subject: Transmittal of Approved RFETS Waste Stream Profile Form Number RF 110.01
TRU Mixed Filter Debris

Dear Mr. Zappe:

The Department of Energy, Carlsbad Field Office (CBFO) has approved the Rocky Flats Environmental Technology Site (RFETS) Waste Stream Profile Form (WSPF) RF 110.01

Enclosed is a copy of the approved form as required by Section B-4(b)(1) of the WIPP Hazardous Waste Facility Permit, No. NM4890139088-TSDF.

If you have any questions on this matter, please contact me at (505) 234-7357 or (505) 706-0066.

Sincerely,

[Signature] for Kerry W. Watson

Kerry W. Watson
CBFO Assistant Manager
Office of National TRU Program

Enclosure

cc: w/o enclosure
J. Kieling, NMED
C. Walker, TechLaw
M. Strum, WTS *ED
R. Chavez, WRES *ED
L. Greene, WRES
S. Calvert, CTAC *ED
WIPP Operating Record
CBFO M&RC

*ED denotes Electronic Distribution



WIPP WASTE STREAM PROFILE FORM

RF110.01, Revision 0

Page 1 of 10

May 18, 2004

Waste Stream Profile Number: RF110.01Generator site name: RFETSTechnical contact: Eric D'AmicoGenerator site EPA ID: CO7890010526Phone number: (303) 966-5362

Date of audit report approval by NMED: March 9, 2000 as amended February 6, 2001; May 24, 2001; June 5, 2001; April 5, 2002; April 8, 2002; August 20, 2002; August 29, 2002; December 20, 2002; April 8, 2003; September 19, 2003; and December 30, 2003

Title, version number, and date of documents used for WAP certification: Rocky Flats Environmental Technology Site TRU Waste Characterization Program Quality Assurance Project Plan, 95-QAPJP-0050, Version 9, February 2004.

Transuranic (TRU) Waste Management Manual, Version 7, 1-MAN-008-WM-001, February 2004. Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant, Revision 1, March 2004.

Did your facility generate this waste? ☒ Yes ☐ No If no, provide the name and EPA ID of the original generator:

Waste Stream Information⁽¹⁾WIPP ID: RF110.01⁽³⁾Summary Category Group: S5000⁽³⁾ Waste Matrix Code Group: Filters⁽³⁾Waste Stream Name: Filters & Media/TRM, Cemented Filters/TRM

Description from the WTWBIR: Flu-Flo filters from the recovery incineration, building 771. Flu-Flo filters used to filter solids from aqueous solutions. High efficiency particulate air filters used on glovebox air intakes and exhausts. This waste consists of filters used in ventilation systems. Drybox filters from all acid lines. Room air exhaust filters. Filters & media consist of pieces ranging in size from 20" x 20" x 4" to 2" x 2" square pieces.

Defense TRU Waste: ☒ Yes ☐ NoCheck one: ☒ CH ☐ RH Number of SWBs N/A Number of Drums 33 Number of Canisters N/ABatch Data Report numbers supporting this waste stream characterization: See Table 7.List applicable EPA Hazardous Waste Codes⁽²⁾: Numbers D004-D011, D022, D029, F001, F002, F005, F006, F007, F009, P030, P098, P099, P106, U003, U103, U108

Applicable TRUCON Content Codes: RF 119A/219A, RF 119BA/219BA, RF 119BAF/219BAF, RF 119C/219C, RF 119D/219D, RF 119DF/219DF, RF 119E/219E, RF 119EF/219EF, RF 119F/219F, RF 119GF/219GF, RF 119H/219H, RF 119J/219J, RF 119K/219K, RF 119KF/219KF, RF 119N/219N, RF 130A/230A, RF 130B/230B, RF 130D/230D, RF 130DF/230DF, RF 130E/230E, RF 130F/230F, RF 130G/230G, RF 130GF/230GF, RF 130I/230I, RF 130J/230J, RF 130K/230K, RF 130N/230N

Acceptable Knowledge Information⁽¹⁾Required Program Information

- Map of site: Reference List, No. 3
- Facility mission description: Reference List, No. 3
- Description of operations that generate waste: Reference List, Nos. 1, 2, 3, 6
- Waste identification/categorization schemes: Reference List, Nos. 8, 9
- Types and quantities of waste generated: Reference List, Nos. 1, 2, 3, 6
- Correlation of waste streams generated from the same building and process, as appropriate: Reference List, Nos. 1, 2, 6
- Waste certification procedures: Reference List, No. 5

Required Waste Stream Information

- Area(s) and building(s) from which the waste stream was generated: Reference List, Nos. 1, 2, 6
- Waste stream volume and time period of generation: Reference List, Nos. 4, 6
- Waste generating process description for each building: Reference List, Nos. 1, 2, 6
- Process flow diagrams: Reference List, Nos. 1, 2
- Material inputs or other information identifying chemical/radionuclide content and physical waste form: Reference List, Nos. 1, 2, 3, 6
- Which Defense Activity generated the waste: (Check one) Reference List, No. 3
 - ☒ Weapons activities including defense inertial confinement fusion
 - ☐ Naval Reactors development
 - ☐ Verification and control technology
 - ☐ Defense research and development
 - ☐ Defense nuclear waste and material by products management
 - ☐ Defense nuclear materials production
 - ☐ Defense nuclear waste and materials security and safeguards and security investigations

WIPP WASTE STREAM PROFILE FORM

RF110.01, Revision 0

Page 2 of 10

May 18, 2004

Supplemental Documentation:

- Process design documents: Note 4
- Standard operating procedures: Note 4
- Safety Analysis Reports: Note 4
- Waste packaging logs: Note 4
- Test plans/research project reports: Note 4
- Site data bases: Note 4
- Information from site personnel: Note 4
- Standard industry documents: Note 4
- Previous analytical data: Note 4
- Material safety data sheets: Note 4
- Sampling and analysis data from comparable/surrogate Waste: Note 4
- Laboratory notebooks: Note 4

Sampling and Analysis Information⁽¹⁾

[For the following, when applicable, enter procedure title(s), number(s) and date(s)]

- ☒ Radiography: Reference List Nos. 13, 14, 19
- ☒ Visual Examination: 11, 12, 16, 17, 18, 20, 21
- ☒ Headspace Gas Analysis
 - VOCs: Reference List, No. 7, 15, 22
 - Flammable: Reference List, No. 7, 15, 22
 - Other gases (specify): N/A
- ☐ Homogeneous Solids/Soils/Gravel Sample Analysis (Tables 1, 3, 4, and 5 are not applicable and not included)
 - Total metals: N/A
 - PCBs: N/A
 - VOCs: N/A
 - Nonhalogenated VOCs: N/A
 - Semi-VOCs: N/A
 - Other (specify): N/A

Waste Stream Profile Form certification:

I hereby certify that I have reviewed the information in this Waste Stream Profile Form, and it is complete and accurate to the best of my knowledge. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

G. A. O'Leary
Signature of Site Project Manager

G. A. O'Leary, Manager TRU Programs
Printed Name and Title

5/18/04
Date

C. L. Ferrera
Signature of Site QA Officer

C. L. Ferrera, TWCP Site QAO
Printed Name and Title

5/18/04
Date

- NOTE**
- (1) Use back of sheet or continuation sheets, if required.
 - (2) EPA Hazardous Waste Codes were determined using acceptable knowledge and confirmed using headspace gas sampling and analysis (see attached Characterization Information Summary documenting this determination).
 - (3) This waste stream differs only in hazardous waste codes from the following waste streams that are identified in the WTWBIR: RF-MT-0328, RF-MR-0331, RF-MT-0331, RF-MT-0335, RF-MR-0338, RF-MT-0338, RF-MR-0342, RF-MT-0342, RF-MR-0376, RF-TT0490, and RF-MT-0491. The WIPP ID assigned corresponds to the Waste Stream Profile Number. The Summary Category Group, Waste Matrix Code Group, and Waste Matrix Code are based on acceptable knowledge (see attached AK Summary). The BIR ID reported in WWIS is assigned using standard BIR conventions for those containers that do not have a valid BIR ID in the WTWBIR.
 - (4) See the References section in the Acceptable Knowledge Summary (attached) for additional backup documentation associated with this waste stream.

REFERENCE LIST

1. Backlog Waste Reassessment Baseline Book, Waste Form 54, Filters and Filter Waste, April 2004.
2. Waste Stream and Residue Identification and Characterization (WSRIC), Version 7, February 2004, and archived versions.
3. RFETS TRU Waste Acceptable Knowledge Supplemental Information, RF/RMRS-97-018, Revision 12, March 2004.
4. Waste and Environmental Management System (WEMS) database.
5. Transuranic (TRU) Waste Certification, PRO-X05-WC-4018, Version 7, March 2004.
6. Acceptable Knowledge TRU/TRM Waste Stream Summaries, RMRS-WIPP-98-100, Section 7.23, Revision 0, April 2004.
7. GC/MS Determination of Volatile Organics Waste Characterization, L-4111-X, January 2002.
8. Waste Characterization, Generation, and Packaging, 1-PRO-079-WGI-001, Revision 4, May 2002.
9. Waste Characterization Program Manual, 1-MAN-036-EWQA-Section 1.6.1, Revision 3, May 2002.
10. Interoffice Memorandum from Douglas K. Sullivan to Eric L. D'Amico, Headspace Gas Analysis Data Evaluation Report For Waste Stream Profile RF110.01 Lot 1, DKS-009-04, April 2004.
11. Visual Examination for Confirmation of RTR, 4-H80-776-ASRF-007, Revision 5, June 2001.
12. TRU/TRM Waste Visual Verification (V^2) and Data Review, PRO-1031-WIPP-1112, Version 3, March 2004.
13. Real-Time Radiography Testing of Transuranic and Low-Level Waste, 4-W30-NDT-00664, Version 10, March 2004.
14. Real-Time Radiography Testing of Transuranic and Low-Level Waste in Building 569, 4-I19-NDT-00569, Revision 6, January 2002.
15. Headspace Gas Sampling And Analysis Using An Automated Manifold, L-4231-F, March 2002.
16. Visual Examination for Confirmation of RTR, PRO-1471-VE-771, Revision 0, November 2001.
17. Glovebox and C-Cell Waste Operations, PRO-1358-440-VERP, Version 6, March 2004.
18. RTR Visual Examination Confirmation, Building 371, PRO-1608-VECRTR-371, Revision 0, October 2002.
19. Mobile Real-Time Radiography Testing of Transuranic and Low-Level Waste, PRO-1520-Mobile-RTR, Version 3, March 2004.
20. Residue Repack, Building 371, PRO-544-SALT REPACK-371, Revision 5, January 2002.
21. Combustible Residue Repackaging, PRO-823-REPACK-371, Revision 1, March 2001.
22. Headspace Gas Sampling and Analysis Using An On-Line Integrated System, PRO-1676-HGAS-S&A, Version 2, January 2004.

CHARACTERIZATION INFORMATION SUMMARY

RF110.01, Revision 0

Page 4 of 10

May 18, 2004

Form A

Reconciliation with Data Quality Objectives

I certify by signature (below) that sufficient data have been collected to determine the following Program-required waste parameters:

WSPF # RF110.01

Item	Check Box ^a	Reconciliation Parameter
1	✓	Waste Matrix Code as reported in WEMS.
2	✓	Waste Material Parameter Weights for individual containers as reported in WEMS.
3	✓	The waste matrix code identified is consistent with the type of sampling and analysis used to characterize the waste.
4	✓	Container mass and activities of each radionuclide of concern as reported in WEMS.
5	✓	Each waste container of waste contains TRU radioactive waste.
6	✓	Mean concentrations, UCL ₉₀ for the mean concentrations, standard deviations, and the number of samples collected for each VOC in the headspace gas of waste containers in the waste stream/waste stream lot.
7	N/A	Mean concentrations, UCL ₉₀ for the mean concentrations, standard deviations, and number of samples collected for VOCs in the waste stream/waste stream lot. Summary Categories S3000 and S4000.
8	N/A	Mean concentrations, UCL ₉₀ for the mean concentrations, standard deviations, number of samples collected for SVOCs in the waste stream/waste stream lot. Summary Categories S3000 and S4000.
9	N/A	Mean concentrations, UCL ₉₀ for the mean concentrations, standard deviations, and number of samples collected for metals in the waste stream/waste stream lot. Summary Categories S3000 and S4000.
10	N/A	Sufficient number of samples was taken to meet statistical sampling requirements.
11	✓	Only validated data were used in the above calculations, as documented through the site data review and validation forms and process.
12	✓	Waste containers were selected randomly for sampling, as documented in site procedures.
13	✓	The potential flammability of TRU waste headspace gases.
14	✓	Sufficient number of waste containers was visually examined to determine with a reasonable level of certainty that the UCL ₉₀ for the misclassification rate is less than 14 percent.
15	✓	Whether the waste stream exhibits a toxicity characteristic (TC) under 40 CFR Part 261, Subpart C.
16	✓	All TICs were appropriately identified and reported in accordance with the requirements of the WIPP WAP prior to submittal of a waste stream profile form for a waste stream or waste stream lot.
17	✓	The overall completeness, comparability, and representativeness QAOs were met for each of the analytical and testing procedures as specified in the WIPP WAP Sections B3-2 through B3-9 prior to submittal of a waste stream profile form for a waste stream or waste stream lot.
18	✓	The RTLs (i.e., PRQLs) for all analyses were met prior to submittal of a waste stream profile form for a waste stream or waste stream lot.
19	✓	Appropriate packaging configuration and DAC were met and documented in the headspace gas sampling documentation and the drum age was met prior to sampling.
20	✓	Whether the waste stream can be classified as hazardous or non-hazardous at the 90-percent confidence limit.

^a Check (✓) indicates that data or acceptable knowledge are sufficient to determine the waste parameters and that the waste parameters have been reported in the listed document or database. N/A indicates parameter does not apply to waste stream. NO indicates data are insufficient.

R. J. Bulanger
Signature of Site Project Manager

G. A. O'Leary
Printed Name

5/18/04
Date

Data Summary Report—Table 2: Headspace Gas Summary Data

WSPF # RF110.01

Sampling and Analysis Method (check one):

☒ 100% Sampling☐ Reduced Sampling

2A

ANALYTE ^a	# Samples ^b	Transform Applied ^c	Normality Test (Pass/Fail) ^d	Mean ^d	UCL ₉₀ ^d	Transformed RTL ^a	Un-Transformed RTL ^a (ppmV)	EPA Code ^e
1,1-Dichloroethane	4	Log	Fail ^b	0.010	0.402	2.303	10	
1,2-Dichloroethane	4	Log	Fail ^b	-0.243	0.023	2.303	10	
1,1-Dichloroethylene	4	Log	Fail ^b	0.149	0.566	2.303	10	
cis-1,2-Dichloroethylene	2	Log	Fail ^b	-0.347	-0.134	2.303	10	
trans-1,2-Dichloroethylene	1	Log	Fail ^b	-0.174	0.052	2.303	10	
1,1,2,2-Tetrachloroethane	1	Sq. Rt.	Fail ^b	0.840	0.928	3.162	10	
1,1,1-Trichloroethane	5	Log	Fail ^b	0.769	1.455	2.303	10	
1,1,2-Trichloro-1,2,2-Trifluoroethane	4	Log	Fail ^b	-0.047	0.252	2.303	10	
1,2,4-Trimethylbenzene	0			0.76			NA	
1,3,5-Trimethylbenzene	0			0.78			NA	
Acetone	10	Log	Pass	2.838	3.137	4.605	100	
Benzene	12	Log	Fail ^b	0.949	1.380	2.303	10	
Bromoform	0			0.75			10	
Butanol	0			8.83			100	
Carbon disulfide	0			0.81			10	
Carbon tetrachloride	5	Log	Fail ^b	0.620	1.218	2.303	10	
Chlorobenzene	2	None	Fail ^b	0.845	0.967	N/A	10	
Chloroform	7	Log	Fail ^b	0.189	0.588	2.303	10	
Cyclohexane	0			0.80			NA	
Ethyl benzene	0			0.74			10	
Ethyl ether	0			0.83			10	
Methanol	8	Log	Fail ^b	2.973	3.398	4.605	100	
Methyl ethyl ketone	5	None	Pass	10.587	11.787	N/A	100	
Methyl isobutyl ketone	1	None	Fail ^b	9.035	10.381	N/A	100	
Methylene chloride	9	Log	Fail ^b	0.339	0.676	2.303	10	
o-Xylene	0			0.77			10	
m,p-Xylene	0			1.42			10	
Tetrachloroethylene	1	Log	Fail ^b	-0.447	-0.220	2.303	10	
Toluene	18	Sq. Rt.	Pass	1.827	2.040	8.487	72.02 ^a	
Trichloroethylene	2	Log	Fail ^b	-0.279	-0.065	2.303	10	

NOTES:

^a A total of 26 samples were collected and analyzed. Analysis was performed for all analytes identified. Samples were not composited. Headspace gas sampling and analysis was conducted on 5 of the 26 containers prior to the addition of trans-1,2-dichloroethylene to the target analyte list.

^b Identifies the number of samples in which the associated analyte was detected.

^c Identifies the type of data transformation used, if applicable, to achieve (or better achieve) a normal probability distribution of the data.

Data Summary Report—Table 2: Headspace Gas Summary Data (continued)

NOTES: (continued)

- ^d Statistics calculated based on using $\frac{1}{2}$ the MDL for less-than-detectable observations with data transformation as identified (Reference 10). When transformation was applied, the Mean and UCL₉₀ values presented are the transformed values (Reference 10). With no detectable concentrations, listed mean reflects average of one-half of reported MDL values for analyte and calculation of standard deviation and UCL₉₀ values is not meaningful. With fewer than five detectable concentrations, calculated values for UCL₉₀ are subject to potentially large relative error.
- ^e RTLs for headspace gas analysis results correspond to the analyte PRQL for analytes that are hazardous waste constituents. "NA" means the analyte is not a WIPP WAP target analyte, but instead a flammable VOC that is analyzed for compliance with the TRUPACT-II Authorized Methods for Payload Control (TRAMPAC).
- ^f No entry indicates no associated EPA Code assigned to the waste stream based on headspace analysis.
- ^g Limit used for evaluation of EPA Hazardous Waste Code for toluene (Reference No. 3).
- ^h Data set (with or without transformation) did not pass the test for normality. The data set that most approximated a normal distribution was used for computation of statistics.

Data Summary Report—Table 2: Headspace Gas Summary Data (continued)

WSPF # RF110.01

2B

TENTATIVELY IDENTIFIED COMPOUND	Maximum Observed Estimated Concentrations (ppmv)	# Samples Containing TIC
Methyl formate, CAS # 107-31-3	45	2
2-Pentanone, CAS # 107-87-9	9.0	1
Pentane, CAS # 109-66-0	6.5	1
1-Pentene, CAS # 109-67-1	8.0	1
Hexane, CAS # 110-54-3	5.0	1
Isobutylene, CAS # 115-11-7	23	1
1-Hexene, CAS # 592-41-6	5.5	1
1-Heptene, CAS # 592-76-7	2.9	1
Methyl chloride, CAS # 74-87-3	11	1
Ethyl chloride, CAS # 75-00-3	7.5	1
2-Chlorobutane, CAS # 78-86-4	4.6	1
Methyl acetate, CAS # 79-20-9	60	2

No TIC listed in 40 CFR 261, Appendix VIII was detected in greater than or equal to 25 percent of the waste containers sampled.

Did the data verify the acceptable knowledge? ☒ Yes ☐ No

Data as reported in Data Summary Report – Table 2 confirm acceptable knowledge in that no additional toxicity characteristic volatile organic or F-listed solvent EPA codes, other than those assigned by acceptable knowledge, are applicable.

If not, describe the basis for assigning the EPA Hazardous Waste Codes:

Data Summary Report—Table 6: Exclusion of Prohibited Items**WSPF # RF110.01**

The absence of prohibited items is documented through acceptable knowledge. Radiography or visual examination is performed on each container in this waste stream to verify the absence of the following prohibited items:

- Liquids
- Non-radionuclide pyrophoric materials
- Waste incompatible with backfill, seal and panel closure materials, container and packaging materials, shipping container materials, or other wastes
- Explosives or compressed gases
- PCBs in concentrations greater than or equal to 50 ppm
- Waste exhibiting the characteristics of ignitability, corrosivity or reactivity
- Non-mixed hazardous wastes

Newly generated waste is characterized by visual verification (VV) at the time of waste packaging using the visual examination (VE) technique unless the use of radiography in lieu of, or in combination with, visual verification is justified by any of the following criteria:

- Visual verification was conducted during packaging, but was unacceptable,
- Visual verification requires extensive handling of high gram content waste that results in high radioactive exposure for the VV personnel,
- Situations where waste packaging is conducted at numerous locations generating small quantities of transuranic waste requiring a large number of VV personnel, and/or
- Where waste was originally packaged as low-level waste, but subsequently determined to be transuranic.

Each container of waste is certified and shipped only after radiography and/or VE either:

1. Did not identify any prohibited items in the waste container, or
2. All prohibited items found in a waste container by radiography or VE are identified and corrected (i.e., eliminated or removed) through the site non-conformance reporting system.

CHARACTERIZATION INFORMATION SUMMARY

RF110.01, Revision 0

Page 9 of 10

May 18, 2004

**Data Summary Report—Table 7: Correlation
of Container Identification to Batch Data Reports**

WSPF # RF110.01

Package No.	Radioassay Data Package	Headspace Sample Batch No.	Headspace VOC Data Package	RTR Data Package ^a	VE or VV Data Package ^b
D59142	440IP1-DP-010604	04W0073	HGAS-DP-00791	6T-2130	
D62751	440IP1-DP-051903	04W0040	HGAS-DP-00761	6T-2118	
D65241	CIQ-00-036	00W0060	HVOC-DP-00333	5T0119	
D65828	440IP1-DP-102803	04W0029	HGAS-DP-00750	6T-2118	
D66732	CPN-01-006	01W0005	HVOC-DP-00362	6T1707	
D66736	569IP1-DP-123002	04W0137	HGAS-DP-00853	6T-2118	
D69430	SGS-371-DP-99-017	04W0092	HGAS-DP-00810	6T2048	
D70155	CIQ-01-007	01W0177	HVOC-DP-00504	6T1722	
D71767	569IP1-DP-100302	04W0096	HGAS-DP-00813	6T2119	
D72630	569IP1-DP-012202	04W0134	HGAS-DP-00850	5T0281	
D78822	CPN-01-023	01W0126	HVOC-DP-00457	6T-1801	
D94347	CIQ-01-059	01W0179	HVOC-DP-00506	6T-1858	
D98718	569IP1-DP-082801	02W0141	HGAS-DP-00255	5T0232	
DA6856	569IP1-DP-041502	04W0149	HGAS-DP-00865	6T1870	
DB3995	371TG1-DP-102201	02W0187	HGAS-DP-00299	6T2074	
DC2476	569IP1-DP-042902A	04W0092	HGAS-DP-00810	5T0299	
DC4225	569IP1-DP-061302	03W0298	HGAS-DP-00624	6T2103	
DC5737	569TG4-DP-011002	04W0129	HGAS-DP-00845	5T-0279	
DC7535	569IP1-DP-021302	04W0102	HGAS-DP-00819	5T0288	
DC7758	371TG1-DP-012502	03W0197	HGAS-DP-00543		WC-DP-085
DC9282	440IP1-DP-092403	04W0175	HGAS-DP-00891		VV-707-00094
DD0918	371TG1-DP-032602	04W0146	HGAS-DP-00862		WC-DP-093
DD3968	569IP1-DP-102402	04W0055	HGAS-DP-00774		VV-707-00042
DD5730	569IP1-DP-103002	04W0115	HGAS-DP-00832		WC-DP-153
DD5731	569IP1-DP-103002	04W0117	HGAS-DP-00834		WC-DP-153
DD6820	440IP1-DP-092603	04W0103	HGAS-DP-00820		VV-776-00049

NOTES:

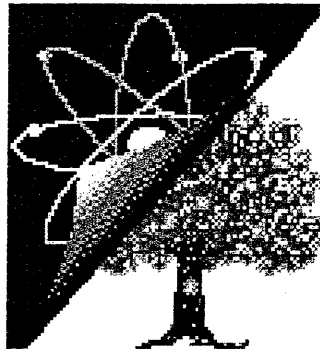
^a No entry indicates visual verification (VV) at the time of waste packaging using the visual examination (VE) technique was performed for the container.

^b No entry indicates container was not selected for visual examination to confirm RTR and did not undergo VV at the time of waste packaging using the VE technique.

Acceptable Knowledge Summary

WSPF # RF110.01

RMRS-WIPP-98-100, Acceptable Knowledge TRU/TRM Waste Stream Summaries, Section 7-23: TRM Filter Debris Waste (D004-D011, D022, D029, F001, F002, F005, F006, F007, F009, P033, P098, P099, P106, U003, U103, U108) (attached).



Rocky Flats Environmental Technology Site

ACCEPTABLE KNOWLEDGE INFORMATION

**ACCEPTABLE KNOWLEDGE TRU/TRM
WASTE STREAM SUMMARIES**

RMRS-WIPP-98-100

Section 7.23

TRM Filter Debris Wastes

**(D004 – D011, D022, D029,
F001, F002, F005, F006, F007, F009,
P030, P098, P099, P106, U003, U103, U108)**

Profile No. RF110.01

Revision 2

Reviewed for Classification/UCNI

By: Unclassified Not UCNI

Reference Exemption Number CEX-032-00

Date: May 26, 2004

7.23 TRM Filter Debris Wastes (D004 – D011, D022, D029, F001, F002, F005, F006, F007, F009, P030, P098, P099, P106, U003, U103, U108)

Profile No. RF110.01

Acceptable Knowledge Waste Stream Summary

Waste Stream Name: TRM Filter Debris Wastes (D004 – D011, D022, D029, F001, F002, F005, F006, F007, F009, P030, P098, P099, P106, U003, U103, U108)

Generation Buildings: Buildings 371, 374, 707, 771, 776, and 777⁽¹⁾

Waste Stream Volume (Retrievably Stored): 19 55-Gallon Drums⁽¹⁾

Generation Dates (Retrievably Stored): October 1988 – August 2001⁽¹⁾

Waste Stream Volume (Newly Generated): 14 55-Gallon Drums⁽¹⁾

Generation Dates (Newly Generated): December 2001 – November 2003⁽¹⁾

Waste Stream Volume (Projected): None^(1,2)

Generation Dates (Projected): N/A^(1,2)

TRUCON Content Codes⁽³⁾: RF 119A/219A, RF 119BA/219BA, RF 119BAF/219BAF, RF 119C/219C, RF 119D/219D, RF 119DF/219DF, RF 119E/219E, RF 119EF/219EF, RF 119F/219F, RF 119GF/219GF, RF 119I/219I, RF 119J/219J, RF 119K/219K, RF 119KF/219KF, RF 119N/219N, RF 130A/230A, RF 130B/230B, RF 130D/230D, RF 130DF/230DF, RF 130E/230E, RF 130F/230F, RF 130G/230G, RF 130GF/230GF, RF 130I/230I, RF 130J/230J, RF 130K/230K, RF 130N/230N,

Process Knowledge Demonstrates Flammable VOCs in Headspace < 500 ppm: No (see Sec. 7.23.6)

7.23.1 WIPP Transuranic Waste Baseline Inventory Report Information⁽⁴⁾

WIPP Identification Numbers: RF110.01

Summary Category Group: S5000 Waste Matrix Code Group: Filters

Waste Matrix Code: S5410 Waste Stream Name: Filters & Media/TRM, Cemented Filters/TRM

Description from the WTWBIR: Flu-Flo filters from the recovery incineration, building 771. Ful-Flo filters used to filter solids from aqueous solutions. High efficiency particulate air filters used on glovebox air intakes and exhausts. This waste consists of filters used in ventilation systems. Drybox filters from all acid lines. Room air exhaust filters. Filters & media consist of pieces ranging in size from 20" x 20" x 4" to 2" x 2" square pieces.

NOTE: This waste stream differs only in hazardous waste codes from the following waste streams that are identified in the WTWBIR: RF-MT-0328, RF-MR-0331, RF-MT-0331, RF-MT-0335, RF-MR-0338, RF-MT-0338, RF-MR-0342, RF-MT-0342, RF-MR-0376, RF-TT0490, and RF-MT-0491. The WIPP ID assigned corresponds to the Waste Stream Profile Number. The Summary Category Group, Waste Matrix Code Group, and Waste Matrix Code are based on acceptable knowledge as provided in Section 7.23.2.

7.23.2 Waste Stream Description

Transuranic Mixed (TRM) filter debris wastes were generated from a variety of operations in support of weapons fabrication and manufacturing including plutonium production, maintenance and utility operations, waste treatment and residue repackaging operations, and decontamination and decommissioning (D&D) of the facilities and equipment utilized in these operations. This waste is generated from similar activities, and is similar in material, physical form, and hazardous constituents, and is therefore considered a single waste stream. Table 7.23-1 presents the waste matrix code and waste material parameters for filter debris wastes.⁽⁵⁾

Table 7.23-1, Filter Debris Wastes Description

IDC	Description	Waste Matrix Code	Waste Material Parameters	Weight % (Average)
328	Filters, Ful-Flo, from Incinerator	S5410, Composite Filters	Cellulosics Plastics	Note 1
331	Filters, Ful-Flo not from Incinerator	S5410, Composite Filters	Cellulosics Plastics Organic Matrix	Note 1
335	Absolute Drybox Filters, Not Acid Contaminated	S5410, Composite Filters	Cellulosics Aluminum-based Metal/Alloys Other Inorganic Materials Rubber	80% 13% 5% 2%
338	Filter Media	S5410, Composite Filters	Aluminum-based Metal/Alloys Other Inorganic Materials	74% 26%
342	Absolute Drybox Filters, Acid Contaminated	S5410, Composite Filters	Cellulosics Aluminum-based Metal/Alloys Other Inorganic Materials Rubber	80% 13% 5% 2%
376	Processed Filter Media	S5410, Composite Filters	Aluminum-based Metal/Alloys Other Inorganic Materials Cellulosics Plastics Organic Matrix	Note 1
490	HEPA Filters (24x24), Not Acid Contaminated	S5410, Composite Filters	Cellulosics Aluminum-based Metal/Alloys Other Inorganic Materials Rubber	64% 26% 9% 1%

Table 7.23-1, Filter Debris Wastes Description (continued)

IDC	Description	Waste Matrix Code	Waste Material Parameters	Weight % (Average)
491	Pre Filter	S5410, Composite Filters	Cellulosics	59%
			Plastics ²	22%
			Other Inorganic Materials	10%
			Iron-based Metal/Alloys	7%
			Aluminum-based Metal/Alloys	1%
			Other Metals	1%

Notes:

The above waste material parameters address the IDC only and do not include internal packaging (e.g. inner bags), container packaging (e.g. fiberboard liner), absorbent (inorganic or polymer), secondary waste, etc.

1. The weight percentages for each waste material parameter are determined on a container basis by RTR and/or visual examination/verification because the variability of the waste stream does not result in a consistent average.
2. The average weight percent of plastic materials is based on RTR and includes plastic liner bags.

Ful-Flo Filters from Incinerators: Ful Flo filters used for collecting particulates from liquid streams associated with the incinerator. These filters are in-line cartridge type filters constructed of plastic or cellulosic materials. The cellulosic filters consist of a one-piece molded media which filtered particulates down to 5 microns in size. The plastic filters consist of a winding and matrix of polypropylene with a polypropylene core.⁽⁶⁾

Ful-Flo Filters not from Incinerators: Ful-Flo filters are in-line cartridge type filters used for collecting particulates from liquid streams. The materials of construction for Ful-Flo filters vary depending on the filter type and style. Some are comprised of a cellulose or acrylic fiber with a phenolic or melamine resin binder. Others have a winding and matrix of polypropylene or cotton with a polypropylene core. Some might have a polypropylene cap on one end. This waste material also includes R-6 cloth filters.^(6,7,14)

Absolute Drybox Filters, Not Acid Contaminated: Drybox filters, not acid contaminated, are HEPA filters used on glovebox air intakes and exhausts. The filters consist of a filter medium contained within a wood frame. Older medium consisted of glass fiber with a small percentage of asbestos and a corrugated aluminum foil. Newer medium is constructed of glass and aromatic polyamide fibers (Nomex) and aluminum alloy metal. Wood filter frames are constructed of ¾-inch fire retardant exterior grade plywood, or particle board.^(6,11)

Filter Media: Filter media is primarily the filter media portion of HEPA filters. This material consists of pieces ranging in size from 20"x20"x4" to 2"x2" square pieces. These pieces are primarily composed of glass fiber. The pieces also contain corrugated aluminum foil. The newer media consist of glass and aromatic polyamide fiber (Nomex) and aluminum alloy metal coated with a thermoset vinyl or epoxy.⁽⁶⁾

Absolute Drybox Filters Acid Contaminated: Absolute drybox filters, acid contaminated, are HEPA filters from gloveboxes with atmospheres that could cause the filters to be contaminated with acids or bases used in chemical processing. The filters consist of a filter medium contained within a wood frame. Older medium consisted of glass fiber with a small percentage of asbestos and a corrugated aluminum foil. Newer medium is constructed of glass and aromatic polyamide fibers (Nomex) and aluminum alloy metal. Wood filter frames are constructed of ¾-inch fire retardant exterior grade plywood, or particle board.⁽⁶⁾

Processed Filter Media: This waste consists primarily of the processed filter media portion of glovebox and plenum HEPA filters. The media is in pieces ranging in size from 20"x20"x4" to 2"x2" square and are primarily composed of glass fiber. The pieces also contain corrugated aluminum foil. The newer media consist of glass and aromatic polyamide fiber (Nomex) and aluminum alloy metal coated with a thermoset vinyl or epoxy. This material also includes Portland cement, added to neutralize acid and absorb any moisture present, Ful-Flo filters with Portland cement added to absorb free liquids, and the remaining material after processing of filter media to recover the plutonium.⁽⁶⁾

HEPA Filters (24 x 24), Not Acid Contaminated: HEPA filters (24 x 24), not acid contaminated, are large HEPA filters used in the filter plenums of all plutonium processing buildings to filter room and glovebox air. The filters consist of a filter medium contained within a wood frame. Older medium consisted of glass fiber with a small percentage of asbestos and a corrugated aluminum foil. Newer medium is constructed of glass and aromatic polyamide fibers (Nomex) and aluminum alloy metal. Wood filter frames are constructed of ¾-inch fire retardant exterior grade plywood, or particle board.⁽⁶⁾

Pre-Filters: This waste consists of a variety of plenum pre-filters used in ventilation systems that filter the room and glovebox air. These filters range from furnace-type filters to pleated fiberglass filters. The filter medium consists of fiberglass packing or paper. Wire mesh may have been used to hold the media in place. The frame material for these filters is cardboard.⁽⁶⁾

7.23.3 Areas of Operation

TRM filter debris wastes in this waste stream are generated by the following defense operations:^(5,6,7,9,11,14,15)

- Plutonium Production
- Maintenance and Utilities
- Waste Treatment and Residue Repackaging
- Decontamination and Decommissioning Operations (D&D)

7.23.4 Generation Processes

TRM filter debris wastes were generated from nearly every operation on site in support of weapons fabrication and manufacturing including plutonium production, maintenance and utility operations, waste treatment and residue repackaging operations, and D&D of the facilities and equipment utilized in these operations.

TRM filters were generated from the filtration of spent solvents and machining oils from production operations in Buildings 707 and 776/777. Solvents consisting of carbon tetrachloride, Freon TF (1,1,2-trichloro-1,2,2-trifluoroethane), or 1,1,1-trichloroethane (TCA), were utilized for cleaning plutonium parts and scrap plutonium in the machining, grit blasting, assembly, and briquetting processes. Particulates from these spent solvents and machining oils collected in filters as these liquids were transferred to the carbon tetrachloride and TCA systems in Buildings 707 and 776/777. The filters from the production gloveboxes and the carbon tetrachloride and TCA operations were generated from filter change out, conducted as necessary.^(6,10,11,13,14)

Utilities in Buildings 371, 374, 707, 771, 776, and 777 included heating, ventilation and air conditioning systems, vacuum systems, and process and waste piping systems. Filters were routinely changed-out. Maintenance activities also included drybox glove and light bulb replacement. Although drybox gloves and light bulbs were normally segregated as separate IDCs, radiography has identified some incandescent light bulbs and drybox gloves in filter debris waste containers.⁽⁶⁾

Separate waste treatment operations were conducted for liquid and solid process wastes. Solid wastes were historically sorted and combustible materials incinerated in Building 771. TRM filters were generated from the filtration of particulates from caustic solution of the incinerator scrubber.^(6,12)

In Buildings 371, and 707, residue materials including incinerator ash, firebrick, sludge, wet combustibles, low grade oxides, as well as residue filters were repackaged to meet residue interim safe storage criteria (ISSC) of plutonium, and WAC for the WIPP. The items were repacked in batches to meet the 10-weight percent plutonium concentration limit. Secondary materials from repackaging include filters contaminated with ash, sludges, oxides, etc.^(6,7,11)

Aqueous liquid waste treatment was conducted in Building 374. The aqueous waste treatment system was comprised of a series of interconnected tanks to treat acidic, caustic, and otherwise radioactive liquids, and separate relatively low-level effluent from contaminated solids and sludges. Acidic waste liquids were neutralized with sodium hydroxide or potassium hydroxide. The solids and sludges from treatment operations were removed from the liquids by filtration and clarification. TRM filters were generated from maintenance and operation of these systems.^(6,8,9)

Liquid wastes containing plutonium were also treated in Building 371. The process is similar to that described for Building 374, but conducted on a smaller scale in gloveboxes. The liquids are neutralized and precipitated with magnesium hydroxide and a polymer flocculent and filtered to remove the solids. The filters are changed out as necessary.^(6,7)

D&D activities include the physical isolation and removal of contaminated gloveboxes, equipment, machinery, furnishings, and support systems. This includes removal and size reduction of glovebox internals, process piping and supports, tanks and ancillary equipment, and other fixed equipment such as ducting, wires, conduits, electrical panels and cabinets. Gloveboxes and equipment are size reduced as necessary and packaged for shipment to WIPP. TRM filters are generated from routine change out of filters in gloveboxes and contamination control facilities utilized for D&D, and as waste from gloveboxes and equipment formerly used for plutonium production, R&D, and/or waste treatment operations undergoing D&D.^(6,11,14,15)

A more detailed description of each of these processes and process flow diagrams can be found in the WSRIC Building Books referenced in Section 7.23.8.

7.23.5 RCRA Characterization

This waste stream is characterized as a mixed waste. As described in Section 7.23.2, this waste is generated from similar activities, and is similar in material, physical form, and hazardous constituents, and is therefore considered a single waste stream. The waste stream as a whole is assigned EPA hazardous waste numbers D004 – D011, D022, D029, F001, F002, F005, F006, F007, F009, P030, P098, P099, P106, U003, U103, and U108. For on site storage, the individual containers of mixed waste in this waste stream are assigned a subset of these EPA hazardous waste numbers because the BWR Baseline Book Subpopulations and WSRIC Process Numbers used by the site do not define waste streams in accordance with the WAP. The specific BWR Baseline Book Subpopulations and WSRIC Process Numbers associated with filter debris wastes in this waste stream are listed in the WEMS AK Waste Stream Summary for Profile Number RF110.01.⁽¹⁶⁾

Visual examination of waste contents at the time of packaging and/or RTR is used to verify that the waste stream is not a liquid waste and does not contain explosives, non-radionuclide pyrophoric materials, compressed gasses, or reactive waste. Although materials in this waste stream are derived from the treatment of cyanide and sulfide bearing wastes, these constituents were rendered non-reactive and the cyanide or sulfide concentrations are below regulatory limits as described in Reference 20. Therefore, this waste stream does not exhibit the characteristics of ignitability (D001), corrosivity (D002), or reactivity (D003).^(4,7,9,11,14,18,19,20,21)

The materials in this waste stream are toxicity characteristic for RCRA metals and organics. Arsenic, barium, cadmium, chromium, lead, mercury, and silver contaminated combustibles were fed to the incinerator, and are assumed to contaminate filters from incinerator operations or ash repackaging operations. Cadmium, chromium, and lead are also present based on analytical data for low-grade oxides filtered in the liquid waste treatment operations. Selenium is present based on analytical data for liquid waste treatment sludge. Lead, in the form of incandescent light bulbs and leaded drybox gloves, has also been identified in this waste. Although

drybox gloves and light bulbs were normally segregated as separate IDCs, radiography has identified some in filter debris waste containers. Therefore, D004, D005, D006, D007, D008, D009, D010, and D011 are assigned to filter debris materials in this waste stream.^(6,7,9,11)

This waste stream also includes containers that were originally assigned to a different filter debris waste stream by acceptable knowledge (AK), but were subsequently segregated into this waste stream after completion of headspace gas sampling/analysis. Chloroform and/or 1,1-dichloroethylene were detected in concentrations above the PRQL in the individual container headspace of these segregated containers. Therefore D022 and D029 are assigned to filter debris materials in this waste stream.⁽⁶⁾

The materials in this waste stream are mixed with, or derived from the treatment of F-listed constituents. TRM filters were generated from filtration of carbon tetrachloride, Freon TF (1,1,2-trichloro-1,2,2-trifluoroethane), and 1,1,1-trichloroethane used for machining, cleaning, and or degreasing. In addition TRM filters were generated from the repackaging of incinerator ash, firebrick, and/or organic residues, which were contaminated with or derived from the treatment of materials contaminated with these solvents and/or butyl alcohol, methyl ethyl ketone, methylene chloride, toluene, tetrachloroethylene, and xylene. This waste stream includes filter debris contaminated with sludge from liquid waste treatment operations. The sludge was derived from the treatment of F-listed waste from all radiological operations on Site, including cyanide-plating operations (F006, F007, F009). This waste stream also includes containers that were originally assigned to a different waste stream by AK, but were subsequently segregated into this waste stream after completion of headspace gas sampling/analysis. F001, F002, and/or F005 listed solvents were detected in concentrations above the PRQL in the individual container headspace of these segregated containers. Therefore, these wastes are assigned EPA hazardous waste numbers F001, F002, F005, F006, F007, and F009.^(6,7,9,11,14)

Although F003 listed solvents butyl alcohol, and xylene were identified as potential contaminants on TRM filters, these solvents are listed solely for ignitability. Because the filter debris waste is a solid and is not ignitable, EPA hazardous waste number F003 is not assigned to this waste stream.

Materials in this waste stream are mixed with, or derived from the treatment of U- and P-listed waste. This waste stream is comprised of filter debris contaminated with soluble cyanide salts, including potassium cyanide, potassium silver cyanide, and sodium cyanide as well as acetonitrile, dimethyl sulfate, and 1,4-dioxane. These waste chemicals were treated in Building 881 and the treatment effluent was subsequently transferred to the radioactive aqueous waste treatment facility in Building 374. TRM filters are contaminated with sludge from these aqueous waste treatment operations. Therefore P030, P098, P099, P106, U003, U103, and U108 are assigned to materials in this waste stream.^(6,9,18)

Beryllium parts were used in the manufacture/assembly of weapons components, and residual beryllium contamination of plutonium parts may have occurred. TRM filter debris associated with these operations may have been contaminated with beryllium and therefore, trace quantities (less than one weight percent) of beryllium may be present in the waste stream. Any beryllium present is as a contaminant of the process and not as unused commercial chemical product, and therefore is not a P015-listed waste.^(6,7,9,11,14)

The filter debris waste streams generated at RFETS and sent to the INEEL for storage have the same IDCs but are considered different waste streams because of the EPA hazardous waste numbers assigned. The INEEL waste streams (Local ID Numbers ID-RFO-328T, ID-RFO-335T, ID-RFO-338T, ID-RFO-376T and ID-RFO-490T) were generated and shipped to INEEL prior to the full implementation of RCRA and therefore, EPA hazardous waste numbers were assigned to each IDC as a whole.⁽⁴⁾

Headspace gas sampling and analysis of containers assigned to this waste stream by AK detected 20 VOCs. Statistics were calculated based on using one-half the method detection limit (MDL) for less-than-detectable observations with data transformation applied where appropriate. Using this "WIPP directed" method, the calculated 90 percent upper confidence limit (UCL₉₀) of the mean concentrations for none of the analytes were found to exceed their associated PRQL values. Consequently, no VOC EPA hazardous waste codes were confirmed by headspace gas sampling/analysis; however, no changes to the AK assigned EPA hazardous waste codes were made based on this data (i.e., all EPA hazardous waste codes assigned by AK are retained for the subject waste stream).^(6,17)

7.23.6 Transportation

The payload containers in this waste stream must also comply with the TRUPACT-II Authorized Methods for Payload Control (TRAMPAC) requirements. Flammable volatile organic compounds (VOCs) including benzene, butanol, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, methanol, methyl ethyl ketone, methyl isobutyl ketone, toluene, and xylenes were identified in this waste stream based on the descriptions in the *BWR Baseline Book*, *WSRIC Building Books*, and headspace gas sampling and analysis. Therefore, flammable VOCs in the payload container headspace have the potential to exceed 500 ppm. All payload containers, including those that exceed 500 ppm flammable VOCs in the headspace gas, are evaluated for compliance with applicable TRAMPAC requirements using the eTRAMPAC system prior to shipment. Any containers not passing the eTRAMPAC compliance evaluation are identified and corrected through the site non-conformance reporting system.^(6,7,9,17)

7.23.7 Radionuclides

Table 7.23-2 summarizes the radionuclides potentially present in TRM filter debris wastes.⁽⁵⁾

Table 7.23-2, Filter Debris Wastes Radionuclides

IDC	Description	Radionuclides ¹	Rationale
328	Filters, Ful-Flo, from Bldg. 771 Incinerator	WG Pu, Am-241, DU, EU, Np-237, Am-243	IDC generated by the Building 771 incinerator, which treated combustibles from numerous processes within the PA.
331	Ful-Flo Filters	WG Pu, Am-241, DU, EU, Np-237, Am-243	IDC generated in nearly every TRU building; radionuclides dependent on generation process
335	Dry Box Filters, Not Acid Contaminated	WG Pu, Am-241, DU, EU, Np-237, Am-243	IDC generated in nearly every TRU building; radionuclides dependent on generation process
338	Filter Media	WG Pu, Am-241, DU, EU, Np-237, Am-243	IDC generated in nearly every TRU building; radionuclides dependent on generation process
342	Dry Box Filters, Acid Contaminated	WG Pu, Am-241, DU, EU, Np-237, Am-243	IDC generated in nearly every TRU building; radionuclides dependent on generation process
376	Processed HEPA Filter Media	WG Pu, Am-241, DU, EU, Np-237, Am-243	Although most of these filters are indicated as being generated in Building 776, they were actually generated in several buildings and processed (cement added) in Building 776.
490	HEPA Filters	WG Pu, Am-241, DU, EU, Np-237, Am-243	IDC generated in nearly every TRU building; radionuclides dependent on generation process
491	Plenum Prefilters	WG Pu, Am-241, DU, EU, Np-237, Am-243	IDC generated in nearly every TRU building; radionuclides dependent on generation process

Key: WG Pu weapons-grade plutonium
 Am-241 americium-241
 DU depleted uranium
 EU enriched uranium
 Np-237 neptunium-237
 Am-243 americium-243

Notes:

1. Am-243 was not initially predicted to be present by AK; however, it has been identified by NDA and is therefore added as a potential radionuclide in this waste stream.

7.23.8 References

1. WASTREN 2004. Interoffice Memorandum from Scott Smith to Waste Records Center. Current and Projected Waste Volumes for TRM Filter Debris Waste (D004 – D011, D022, D029, F001, F002, F005, F006, F007, F009, P030, P098, P099, P106, U003, U103, U108), SMS-006-2004. April 16, 2004.
2. WASTREN 2003. Interoffice Memorandum from Jeff Harrison to Eric D'Amico. Projected Waste Stream Volumes and Generation Dates for TRU and TRM Waste, JLH-011-2003. February 12, 2003.
3. RFETS 2004. Transuranic (TRU) Waste Management Manual, Version 7, 1-MAN-008-WM-001.
4. DOE 1995. WIPP Transuranic Waste Baseline Inventory Report, Revision 2. DOE/CAO-95-1121.
5. RFETS 2004. RFETS TRU Waste Acceptable Knowledge Supplemental Information. RF/RMRS-97-018, Revision 13.
6. RFETS 2004. Backlog Waste Reassessment Baseline Book, Waste Form 54, Filters and Filter Waste.
7. RFETS 2003. Waste Stream and Residue Identification and Characterization, Building 371, Version 7.0.
8. EG&G 1993. Waste Stream and Residue Identification and Characterization, Building 374, Version 3.2.
9. RFETS 2003. Waste Stream and Residue Identification and Characterization, Building 374, Version 7.0.
10. EG&G 1992. Waste Stream and Residue Identification and Characterization, Building 707, Version 3.2.
11. RFETS 2003. Waste Stream and Residue Identification and Characterization, Building 707, Version 7.0.
12. EG&G 1992. Waste Stream and Residue Identification and Characterization, Building 771, Version 3.2.
13. EG&G 1991. Waste Stream and Residue Identification and Characterization, Building 777, Version 3.2.
14. RFETS 2003. Waste Stream and Residue Identification and Characterization, Building 776/777, Version 7.0.
15. RFETS 2003. Waste Stream and Residue Identification and Characterization, Decontamination/Decommissioning WSRIC Building Book, Version 7.0.
16. RFETS 2003. Waste and Environmental Management System (WEMS) Database.

17. Interoffice Memorandum from Douglas K. Sullivan to Eric L. D'Amico, Headspace Gas Analysis Data Evaluation Report For Waste Stream Profile RF110.01 Lot 1, DKS-009-04, April 2004.
18. Kaiser-Hill 2001. Letter from Karen North to James Hindman, Colorado Department of Public Health and Environment. Response to Request for Additional Information on Environmental Protection Agency (EPA) Hazardous Waste "P" and "U" Codes Relative to B374 Operations, KN-111-01. August 29, 2001.
19. WASTREN 2003. Interoffice Memorandum from Scott Smith to Waste Records. Reactivity Characteristic Evaluation for Waste Derived from Aqueous Liquid Waste Treatment Operations, SMS-008-2003. November 17, 2003.
20. Department of Energy, Carlsbad Field Office letter from Dr. Ines Triay and S. D. Warren to Mr. Steve Zappe; Request for Permit Modification to the Hazardous Waste Facility Permit, Permit Number NM4890139088-TSDF, Waste Characterization Updates and Other Process Improvements; Item 5: Add New Hazardous Waste Numbers, May 13, 2003.
21. State of New Mexico Environment Department letter from Ron Curry to Dr. Ines Triay and Dr. Steven Warren; Final Determination, Class 2 Modification Requests WIPP Hazardous Waste Facility Permit EPA I.D. NM4890139088; approving Item 5 to add hazardous waste numbers, September 11, 2003.